

(b) The tank must be equipped with piping systems for vapor venting and transfer of lading, and with pressure relief devices, controls, gages and valves, as prescribed herein.

[Amdt. 179-32, 48 FR 27708, June 16, 1983, as amended at 68 FR 75763, Dec. 31, 2003]

**§ 179.400-4 Insulation system and performance standard.**

(a) For the purposes of this specification—

(1) *Standard Heat Transfer Rate* (SHTR), expressed in Btu/day/lb of water capacity, means the rate of heat transfer used for determining the satisfactory performance of the insulation system of a cryogenic tank car tank in cryogenic liquid service (see § 179.401-1 table).

(2) *Test cryogenic liquid* means the cryogenic liquid, which may be different from the lading intended to be shipped in the tank, being used during the performance tests of the insulation system.

(3) *Normal evaporation rate* (NER), expressed in lbs. (of the cryogenic liquid)/day, means the rate of evaporation, determined by test of a test cryogenic liquid in a tank maintained at a pressure of approximately one atmosphere, absolute. This determination of the NER is the NER test.

(4) *Stabilization period* means the elapsed time after a tank car tank is filled with the test cryogenic liquid until the NER has stabilized, or 24 hours has passed, whichever is greater.

(5) *Calculated heat transfer rate*. The calculated heat transfer rate (CHTR) is determined by the use of test data obtained during the NER test in the formula:

$$q = [N(\Delta h)(90-t_i)] / [V(8.32828)(t_s-t_r)]$$

Where:

q = CHTR, in Btu/day/lb., of water capacity;  
N = NER, determined by NER test, in lbs./day;

Δh = latent heat of vaporization of the test cryogenic liquid at the NER test pressure of approximately one atmosphere, absolute, in Btu/lb.;

90 = ambient temperature at 90 °F.;

V = gross water volume at 60 °F. of the inner tank, in gallons;

t<sub>i</sub> = equilibrium temperature of intended lading at maximum shipping pressure, in °F.;

8.32828 = constant for converting gallons of water at 60 °F. to lbs. of water at 60 °F., in lbs./gallon;

t<sub>s</sub> = average temperature of outer jacket, determined by averaging jacket temperatures at various locations on the jacket at regular intervals during the NER test, in °F.;

t<sub>r</sub> = equilibrium temperature of the test cryogenic liquid at the NER test pressure of approximately, one atmosphere, absolute, in °F.

(b) DOT-113A60W tank cars must—

(1) Be filled with hydrogen, cryogenic liquid to the maximum permitted fill density specified in § 173.319(d)(2) table of this subchapter prior to performing the NER test; and

(2) Have a CHTR equal to or less than the SHTR specified in § 179.401-1 table for a DOT-113A60W tank car.

(c) DOT-113C120W tank cars must—

(1) Be filled with ethylene, cryogenic liquid to the maximum permitted fill density specified in § 173.319(d)(2) table of this subchapter prior to performing the NER test, or be filled with nitrogen, cryogenic liquid to 90 percent of the volumetric capacity of the inner tank prior to performing the NER test; and

(2) Have a CHTR equal to or less than 75 percent of the SHTR specified in § 179.401-1 table for a DOT-113C120W tank car.

(d) Insulating materials must be approved.

(e) If the insulation consists of a powder having a tendency to settle, the entire top of the cylindrical portion of the inner tank must be insulated with a layer of glass fiber insulation at least one-inch nominal thickness, or equivalent, suitably held in position and covering an area extending 25 degrees to each side of the top center line of the inner tank.

(f) The outer jacket must be provided with fittings to permit effective evacuation of the annular space between the outer jacket and the inner tank.

(g) A device to measure the absolute pressure in the annular space must be provided. The device must be portable with an easily accessible connection or permanently positioned where it is readily visible to the operator.

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